

Express Mail Certificate No. EV298592345US

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
APPLICATION FOR LETTERS PATENT

Applicants: Jen-Cheng LIN

Title : CARTRIDGE ASSEMBLY OF A
WATER COOLED RADIATOR

6 Claims

5 Sheets of Drawings

William E. Pelton
Reg. No. 25,702
Donald S. Dowden
Reg. No. 20,701
Cooper & Dunham LLP
1185 Avenue of the Americas
New York, New York 10036
(212) 278-0400

1 **CARTRIDGE ASSEMBLY OF A WATER COOLED RADIATOR**

2 **BACKGROUND OF THE INVENTION**

3 **1. Field of the Invention**

4 The present invention relates to a cartridge assembly of a water cooled
5 for cooling a central processor in a computer, in particular to a water cooled
6 radiator having a water tank and a booster pump concealed in cartridge shell for
7 easy installation in a computer, having the advantages of safe usage, harmonious
8 design, and easy operability.

9 **2. Description of Related Arts**

10 As the size of integrated circuits becomes smaller and smaller, the
11 density of components being packed into an integrated circuit, on the contrast,
12 continues to multiply. When the central processor of a computer, typically built
13 with an integrated circuit, is enabled to perform internal computation, the
14 operating temperature will rise sharply inside the computer casing if not properly
15 controlled. The rising temperature is known to be the main cause for slowing
16 down the operation speed of processors. After running for a prolonged time at
17 excessively high temperature, such a processor may be burnt out or hardware
18 errors may result. To solve the temperature problems, cooling fans and heat sinks
19 are generally used to cool down the temperature of the central processor.

20 A more recent invention is the use of a water cooled radiator for effective
21 control of the operating temperature of the central processor. The main idea is to
22 make use of circulating water as a heat conduction medium for heat dissipation.
23 The water-holding tank is installed externally and the piping is connected to the
24 inside of the computer. As water circulates around the central processor, heat is

1 absorbed around the central processor and inside the computer casing, but there
2 are certain weaknesses in the structure of the water radiator design and these are
3 mentioned below.

4 (1) As the water tank is mounted externally and attached to the computer
5 by simple mechanical means, this may spoil the elegance and integrity of the
6 computer shape. The exposed piping may also cause water leakage due to
7 loosening of the connection or physical damage to the circulation piping; and

8 (2) The condition of water in the water tank is hard to maintain, as dirt
9 often settles at the tank base making it difficult to clean.

10 Accordingly, there is considerable room for further improvement on the
11 design of the water cooled radiator.

12 SUMMARY OF THE INVENTION

13 The primary object of the present invention is to provide a cartridge
14 assembly of a water cooled radiator used for cooling down the operating
15 temperature central processor in a computer for safe usage, harmonious design,
16 and easy operability.

17 To this end, the instrumentality of the present invention is to design a
18 cartridge assembly containing a water tank and a booster pump within the
19 external shell, with piping interconnecting between the water tank and the
20 booster pump. The dimension of the shell can fit into a 5.25" drive of a desktop
21 computer. The circulation piping of the water cooled radiator is formed by an
22 intake pipe and a return pipe. The intake pipe is connected between the booster
23 pump and the central processor, and the return pipe is connected between the
24 central processor and water tank.

1 For refilling the water tank, a unique lock-and-release mechanism is
2 used, by means of four first springs, a second spring, an anchoring plate, and a
3 catch box, wherein

4 each first spring is mounted respectively on one of four legs of the
5 handles connecting between the end of the handle and the water tank;

6 the anchoring plate having a column in the center is fixed on the shell
7 wall using the bottom portion thereof;

8 the second spring is mounted between the column of the anchoring plate
9 and the back wall of the water tank; and

10 the catch box is fixed on the shell wall using the bottom portion, having a
11 front opening corresponding to the position of a protruding rod fixed on the back
12 wall of the water tank.

13 With springs supporting the water tank, when pressure is applied on the
14 push button, the water tank and the face panel will be forced out slightly relative
15 to the immovable shell wall, thus exposing the plug on top of the water tank.

16 The secondary object of the present invention is to open up a transparent
17 window on the face panel for visually checking the water level in the water tank.

18 If the water level drops below a predetermined level, refilling with water is
19 required to maintain the normal operation of the water cooled radiator.

20 The design of the present invention has the advantages of safe usage,
21 harmonious appearance, and easy operability.

22 The features and structure of the present invention will be more clearly
23 understood when taken in conjunction with the accompanying drawings.

1 BRIEF DESCRIPTION OF THE DRAWINGS

2 Fig. 1 is a perspective view of the present invention;
3 Fig. 2 is a front view of the face panel;
4 Fig. 3 is a top and plane view of the system architecture;
5 Fig. 4 is a partial enlargement of the handle and spring portion;
6 Fig. 5 is a perspective view of a preferred embodiment actually being
7 installed in a computer;
8 Fig. 6 is a top and plane view diagram depicting a mechanism for
9 managing the refilling of the water tank in accordance with the present invention.

10 DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

11 The present invention provides a cartridge assembly of a water cooled
12 radiator as shown in Fig. 1, comprising:
13 an external shell (10) having a dimension that can fit into a 5.25" drive
14 bay of the computer for easy installation into the computer;
15 a water tank (20) being installed in the front portion of the cartridge
16 inside the shell (10) for holding water, wherein the water tank (20) has a plug (22)
17 on top that can be removed for refilling the water tank (20) with water;
18 a booster pump (30) for boosting the water pressure and being installed
19 in the back portion of the cartridge behind the water tank (20) inside the shell (10),
20 with piping (32) connecting between the booster pump (30) and the water tank
21 (20); and
22 a face panel (102) being installed at the front of the shell (10), as shown
23 in Fig. 2, wherein
24 the face panel (102) has a transparent window (14) for visually

1 monitoring the water level in the water tank (20); if the water level is found
2 below a predetermined level, it is necessary to replenish the water for normal
3 operation of the water cooled radiator;
4 the face panel (102) has a push button (104), such that the back end of the
5 push button (104) is fixed to the front wall of the water tank (20), leaving an
6 appropriate gap between the front wall of the water tank (20) and the face panel
7 (102); and

8 the face panel (102) has two handles (12) respectively fitted on two sides,
9 wherein each handle (12) is formed by an angular bend, and the back end of the
10 handle (12) extends past the face panel (102) to the backside of the face panel
11 (102), where a first spring is respectively mounted between one back end of the
12 handle (12) and the water tank (20), as shown in Fig. 4.

13 Since the computer generally has a central processor at the hub, the
14 temperature of the central processor will rise when performing internal
15 computation. For a water cooled radiator, the circulation piping (32) extends into
16 the computer casing to absorb internal heat around the central processor, forming
17 an intake pipe (34) and a return pipe (36). The intake pipe (34) is used for
18 directing inflow water between the booster pump (30) and the central processor,
19 and the return pipe (36) is for directing return water between the water tank (20)
20 and the central processor.

21 The present invention uses a number of unique designs. The front portion
22 of the cartridge including the face panel and the water tank is designed to be
23 movable, whilst the back portion including the booster pump and related piping
24 can be conceived as the immovable portion. The push button on the face panel is

1 used for triggering a lock-and-release mechanism to be mentioned below.

2 According to the present invention, a lock-and-release mechanism, as
3 shown in Fig. 3, is employed to manage refilling of the water tank. The lock-
4 and-release mechanism is orchestrated by the synchronized action of first springs
5 (122) mounted between the water tank (20) and the face panel (102), a second
6 spring (134) mounted between the water tank (20) and an anchoring plate (13), a
7 catch box (202) fixed on the shell wall, and a push button (104) mounted on the
8 face panel (102).

9 The anchoring plate (13) has a column (132) in the center and fixed on
10 the shell wall using the bottom portion thereof, and the anchoring plate (13) is
11 used for mounting a second spring (134) between the column (132) and the back
12 wall of the water tank (20).

13 The catch box (202) has a front opening and is fixed on the shell wall
14 using the bottom portion. The front opening corresponds to the position of a rod
15 (204) protruding from the back end of the water tank (20). The rod (204) has a
16 ball on the far end for engaging the catch box (202).

17 Pressing down the push button (104) the first time will cause the
18 protruding rod (204) to push through the front opening of the catch box (202),
19 and pressing the push button (104) the second time will cause the protruding rod
20 (204) to retract and close off the front opening of catch box (202). As the
21 above-mentioned action of the catch box (202) and the protruding rod (204) is
22 taken from a known mechanical structure and operation principles, further details
23 need not be provided. The operation of the lock-and-release mechanism in the
24 cartridge assembly is diagrammatically illustrated in Figs. 3 and 6.

1 The pressing down action generates a counter pressure on the second
2 spring to a point will be able to offset the force by the four first springs, thus
3 causing the face panel and the water tank to be pushed out slightly relative to the
4 immovable shell, such that the plug on top the exposed water tank can be easily
5 pulled out for refilling the water tank.

6 The transparent window in accordance with the present invention is
7 designed for visually monitoring of the water level in the water tank. If the water
8 level is below the predetermined level, it is necessary to replenish the water to
9 maintain the normal cooling for the central processor.

10 In summary, the present invention, as implemented by the preferred
11 embodiment shown in Fig. 5, provides a cartridge assembly of a water cooled
12 radiator with a water tank and a booster pump concealed inside the external shell.
13 The booster pump is connected by piping to the central processor in the computer,
14 such that circulating water can be used as a medium to absorb the heat generated
15 by the central processor and other components inside the computer. The internal
16 heat can be systematically dissipated by a heat exchanger installed on the
17 computer. The present invention has the advantages of safe usage, harmonious
18 appearance, and easy operability.

19 The foregoing description of the preferred embodiments of the present
20 invention is intended to be illustrative only and, under no circumstances, should
21 the scope of the present invention be so restricted.